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ENUMERATION OF THE NORTH AMERICAN CERCOSPORÆ.

WITH DESCRIPTIONS OF THE SPECIES.

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The genus CERCOSPORA which was established by Fresenius about thirty years ago, comprised at first only a few species, taken mostly from several other genera in which they did not seem properly to belong. In his *Beitrage zur Mycologie* (1863) he describes four species. Fuckel, in his *Symbolæ Mycologicæ* (1869), enumerates ten species. Saccardo, in the first volume of *Michelia*, mentions and describes thirty-eight species, and in the second volume (1882) adds about twenty more. Thirty-seven additional species have been described by Cooke in *Grevillea*. Peck, in the *Reports of the N. Y. State Museum* has added about a dozen, while Von Thumen, Dr. Winter, and various others, including the writers of this article, have further contributed to swell the number of published species, till the list has become almost formidable. And now, before this rapidly accumulating mass of new and old species shall become entirely unmanageable, we have thought it might be well to "take an account of stock," to see, if possible, how we stand. With this object in view, we have made this "Enumeration" of the species thus far described in this country. We have tried to reduce and condense the list as far as consistently could be done, and, if we have failed to do this satisfactorily our labor still will not be lost, for, by bringing the scattered fragments together into one body, we have made it easier for others to carry on and complete the work which is here begun.

CERCOSPORA (Gr. *kerkos* a tail, and *spora* a spore) is a genus of

Hyphomycetous fungi growing mostly on living leaves, generally on dead or discolored spots, and consisting of little tufts of erect, brown, or sometimes nearly colorless (hyaline) threads (hyphæ) bearing terminal or (exceptionally) lateral, elongated, septate, pale brownish or hyaline spores (conidia) which are generally attenuated above. The hyphæ arise from a more or less distinct tubercular base and are generally undulate above or are abruptly bent this way and that, or imperfectly toothed and swollen at intervals (nodulose) and occasionally sparingly branched. The conidia are, for the most part, terminal, but occasionally arise also from little tooth-like projections on the sides of the hyphæ below the apex. They are cylindrical, hyaline and without septa (continuous) at first but soon become elongated and septate, and are usually attenuated above, often very distinctly so, and at maturity become slightly brownish, but in most of the species this brown tint is so faint that the conidia are called hyaline. There are, however, species with decidedly brown conidia (Nos. 25, 27, 101.)

CERCOSPORA is confluent on one side with *Helminthosporium* from which it differs in its less rigid and paler hyphæ and conidia, and on the other with *Ramularia* which has both hyphæ and conidia hyaline. Probably none of the species are autonomous, being apparently only the conidial stage of various species of *Sphærella* or other sphæriaceous fungi.

Thanks are due to Dr. Geo. Martin, of West Chester, Pa., who has carefully examined many of the species here described and placed his notes at our disposal.

The species may be grouped, for convenience, according to the presence, absence, color, etc., of the spots.

A. Hyphæ brown.
- *a.* Spots orbicular or suborbicular, gray, cinereous or white, 1–19.
- *b.* " " " " brown, at least when young, 20–50.
- *c.* Spots angular or irregular, 51–65.
- *d.* Spots indefinite, 66–75.
- *e.* Spots none, or at least not very conspicuous.
  - a. Tufts scattered, 76–82.
  - b. Tufts effused, 83-101.

B. Hyphæ nearly hyaline (Cercosporella, Sacc.), 102-108.

C. Species standing ambiguously between CERCOSPORA and RAMULARIA, 109 et seq.

A. Hyphæ brown.

a. Spots orbicular or suborbicular, gray, cinereous or white.

1. CERCOSPORA FLAGELLARIS, E. & M., Am. Nat., Dec. '82, p. 1003. N. A. F., 1256.

Spots pallid-white (2—8 mm.) with a narrow, raised, reddish brown border, round or irregular, often confluent, mostly on withered parts of the leaf. Hyphæ tufted, brownish, undulate and nodulose above, 75—80

x 4 μ. Conidia slender, attenuated above, 8—10 septate, 80—112 x 4 μ. Amphigenous, but more perfectly developed on the lower surface of the leaf.

On leaves of *Phytolacca decandra*, from various localities.

2. CERCOSPORA DIANTHERÆ, E. & K., Jour. of Mycol., I. p. 2.

On round, white spots (2—4 mm.) and mostly included in or surrounded by brown, dead areas of the leaf which again are either indefinitely limited or are bounded by a definite, darker, narrow border. Tufts small, loose, spreading, of only a few threads each (3—12), on the white spots. Hyphæ brown, continuous or sparingly and faintly septate, geniculate and toothed above, 60—80 x 4 μ. Conidia slender, linear oblanceolate, 80—120 x 4—5 μ, multiseptate, hyaline. Allied to the preceding.

On leaves of *Dianthera Americana*, Sept., Kansas (Kellerman.)

3. CERCOSPORA VIOLÆ, Sacc., F. Ven. nov. vel. crit., V p. 187.

Spots suborbicular, dry and pale. Hyphæ amphigenous, short, simple, fuscous, 30—35 x 4 μ. Conidia very long, 150—200 x 3½ μ, wand-shaped, multiseptate, hyaline.

On leaves of Violet, August, N. Y. (Peck), Iowa (Holway.)

4. CERCOSPORA CHENOPODII, Fres. Beitrag. p. 92. Michelia, vol. II., p. 364. Exsiccati, de Thum, M. U., No. 374. Rav. Fungi Amer., 591. Ellis N. A. F., 550.

Hyphæ amphigenous, fasciculate, simple or 1-septate, 40—50 x 5—6 μ, brown. Conidia subcylindrical, ends subobtuse, slightly curved, 60—70 x 6—8 μ, 4—5 septate, with a brownish shade, on pale, thin, light-colored spots ¼—½ cm.

On leaves of *C. album* and probably other species of *Chenopodium*. Common.

5. CERCOSPORA PLANTAGINIS, Sacc., Mich. I., p. 267.

Spots small (1—2 mm.) round, white, thin with a narrow, reddish brown border. Hyphæ fasciculate, brown, septate, 40—60 x 3 μ, forming minute tufts. Conidia slender, obclavate, acute above, multiseptate, hyaline, 80—200 x 3—4 μ.

On leaves of *Plantago lanceolata*, Newfield, N. J., and also on *P. major*, Kansas (Kellerman.)

6. CERCOSPORA PHYSALIDIS, Ell. Am., Nat., Oct. '82, p. 810.

Amphigenous; on white, round, deciduous spots, (1—3 mm.) Hyphæ fasciculate, brown, subnodulose, 45—55 x 5—5½ μ. Conidia clavate, cylindrical, faintly 5—8 septate, hyaline, 65—75 x 4 μ.

On leaves of several species of *Physalis*. From Kentucky and Kansas (Kellerman), to Wisconsin (Trelease).

7. CERCOSPORA EUONYMI, Ell. l. c. N. A. F. 1245.

Amphigenous; on small, round, white spots (1—2 mm.) with a dark purple border. Hyphæ fasciculate, subnodulose, brown, about 60 μ high. Conidia obclavate-cylindrical, 3—5 septate, hyaline, 50—65 x 7—8 μ.

On leaves of *Euonymus Americanus* and *E. Europæus*, Ky. (Kellerman

8. CERCOSPORA ASCLEPIADIS, Ell. l. c. *C. venturioides*, Pk ? 34th Rep. N. Y. St. Mus., p. 47.

Amphigenous, but mostly epiphyllous, on suborbicular spots (1—3 mm.) black at first then becoming white in the center, with a definite dark brown or nearly black raised border around which the leaf is stained purplish brown. Hyphæ fasciculate, subnodulose, and sparingly subdentate above, brown, 40—50 x 4 μ. Conidia linear-obclavate, about 5-septate, hyaline, 80—120 x 3½—4 μ

On *Asclepias Cornuti*. Quite different from *C. clavata*, Ger.

9. CERCOSPORA TEUCRII, E. & K. Bull. Torr. Bot. Club, vol. XI. p. 116

Epiphyllous, on brown (1—2 mm) spots which soon become dirty white with a dark purple shaded border. Hyphæ tufted, brown, crooked and subdenticulate above, 75—120 x 4 μ, faintly septate. Conidia long and slender, 75—120 x 3—4 μ, faintly septate.

On leaves of *Teucrium Canadense*, Aug., Kansas (Kellerman.)

10. CERCOSPORA ACALYPHÆ, Pk. 34th Rep. N. Y. State Mus., p. 48.

Spots very small, orbicular, dry, whitish, with a narrow purplish brown border. Hyphæ epiphyllous, tufted, subflexuous, septate, colored, 54—75 x 5 μ. Conidia slender, rod-like, 5—7 septate, colorless, 50—100 x 3 μ.

On leaves of *Acalypha Virginica*. N. Y. (Pk.), Kansas (Kellerman.)

11. CERCOSPORA CITRULLINA, Cke. Grev. XII. p. 31. Rav. F. Amer. 589.

Epiphyllous. Spots orbicular (2—4 mm.) whitish with a purple shaded border. Hyphæ pale-olivaceous, elongated. Conidia very long, attenuated above, sparingly septate, hyaline, 120—140 x 3 μ.

On leaves of watermelon. S. Carolina (Ravenel.)

12. CERCOSPORA BETICOLA, Sacc. Fungi Ven. nov. vel. crit. Ser. V. p. 189. N. A. F., No. 48.

Amphigenous. Spots suborbicular arid, grayish (2—3 mm.) with a purplish border. Hyphæ fasciculate, mostly without septa, 40—50 x 4—5 μ, brownish, nodulose above. Conidia narrow, linear, multiseptate, hyaline, 70—120 x 3 μ.

On leaves of cultivated beet. Common.

13. CERCOSPORA ANTIPUS, Ell. & Hol. Jour. of Mycol. I. p. 5.

Amphigenous but mostly hypophyllous, on round (3—4 mm.) spots, dirty gray above and ferrugineous-brown below, with a rather broad, raised, dark colored border. Hyphæ fasciculate, brown undulate and subgeniculate, imperfectly toothed above; conidia cylindrical or clavate -cylindrical with a pale yellowish tint, becoming faintly 3—5 septate, 30—40 x 2½ x 3 μ. *Sphærella Clymeniæ*, Sacc. occurs on the upper surface of the spots.

On leaves of *Lonicera flava*, August, Iowa (Holway.)

14. CERCOSPORA ZINNIÆ, E. & M. *n. s.*

Spots ¼—½ cm. across, consisting of a small (1—1½ mm.) white center

with an indefinite, dirty red-brown margin — or oftener on the brown area appear many small, white, round spots which become at length more or less confluent. Hyphæ epiphyllous, fasciculate, brown, continuous or sparingly septate, 40—60 x 4—5 μ, abruptly bent and crooked above. Conidia oblong or cylindrical, 1—2 septate, 16—30 x 4 μ, hyaline.

On leaves of *Zinnia multiflora*, Florida (Dr. Martin.)

15. CERCOSPORA ISANTHI, E. & K. Bull. Torr. Bot. Club, XI. p. 115.

On round (1 mm.) white spots, with a narrow raised border. Hyphæ tufted (25—30 x 4 μ), crooked and subdentate above, continuous, brown. Conidia clavate-cylindrical, multiseptate, 75—100 x 3—4 μ. The spots are at first purplish, with a purple shaded border but soon whiten out.

On leaves of *Isanthus cæruleus*, Manhattan, Kas. Aug. (Kellerman.)

16. CERCOSPORA CROTONIFOLIA, Cke. Grev. XII. p. 31. Rav. F. Amer. 593.

Hyphæ epiphyllous, short or obsolete, on round, light colored definite spots (3—4 mm.) Conidia cylindrical, straight, subobtuse, 1—3 septate, hyaline, 28—40 x 3 μ.

On leaves of *Croton glandulosum*. S. Carolina (Ravenel.) This has the general appearance of *C. Chenopodii*, Fres.

17. CERCOSPORA RESEDÆ, Fuckl. Symbolæ Myc., p. 353. N. A. F., 375. *Virgasporium maculatum*, Cke., Grev. III. p. 182., id. IV. p. 69.

Spots pallid, arid, round, (2—4 mm.) with a slightly raised, pale border. Hyphæ amphigenous, cæspitose, simple, continuous or faintly septate, nearly straight below but more or less crooked and irregular above, fuscous, 50—70 x 4—5 μ, forming little grayish tufts thickly scattered over the central part of the spots. Conidia linear-obclavate, 4—5 septate, 100—140 x 2½—3 μ, hyaline.

On living leaves of *Reseda odorata*, Penn. (Martin.)

18. CERCOSPORA CANESCENS, E. & M., Am. Nat. Dec. '82, p. 1003. N. A. F., 1249.

Spots brown, becoming gray and dirty white, suborbicular, irregular and confluent (¼—½ cm.), mostly on dead portions of the leaf, mostly with a narrow, definite, reddish brown border on the upper side of the leaf. Hyphæ cæspitose, brown, 90—110 x 5—6 μ, forming little black tufts. Conidia obclavate-cylindrical, 5—8 septate, hyaline 100—120 x 5—6 μ, mostly epiphyllous.

On leaves of *Phaseolus* (cult.) Newfield, N. J.

19. CERCOSPORA VERNONIÆ, E. & K. Am. Nat., Nov. '83, p. 1166.

Epiphyllous, on small (1—3 mm.) round, gray or purplish gray spots (which finally whiten out) with a distinct, narrow, raised border which is surrounded by a purplish discoloration. Hyphæ cæspitose, subfuscous, continuous, subnodulose and subdenticulate above, 25—40 x 4—5 μ. Conidia slender, clavate, 6—9 septate, 75—100 x 3—4 μ.

On leaves of *Vernonia Baldwinii*, Kansas (Kellerman.)

This differs from *C. oculata*, E. & K., in the different character of the spots and its longer and more distinctly septate conidia.

b. Spots orbicular or suborbicular, brown.

20. CERCOSPORA OCULATA, E. & K. Bull. Torr. Bot. Club, XI. p. 116.

Mostly epiphyllous, on dirty brown spots (.25—.75 cm.) with a definite, slightly raised, narrow, darker border; hyphæ cæspitose, short (25—30 x 4 μ) obtuse, simple, brown, continuous, entire or slightly denticulate above; conidia at first oblong and 1-septate, 20—30 μ long, at length attenuated below and becoming 30—60 x 3—4 μ and faintly 3-septate.

The spots are often concentrically wrinkled and sometimes confluent, forming patches 2—3 cm. across.

On leaves of *Vernonia Baldwinii*. July. Kansas (Kellerman.)

21. CERCOSPORA CALLÆ, Pk. & Clinton. 29th Rep. N. Y. State Mus. p. 52. N. A. F., No. 1253.

Spots definite, oblong, pale (½—1 x ¼ cm.) with a reddish brown border. Hyphæ amphigenous, short, flexuous, somewhat nodulose, not at all or indistinctly septate, slightly colored, cinereous or subolivaceous in the mass, growing in minute, scattered tufts. Conidia cylindrical or obclavate, at first continuous then elongated and 1—5 septate, nearly straight, 30—75 μ long.

On living leaves of *Calla palustris*. Aug. Buffalo, N. Y. (Clinton.)

Closely allied to *C. nymphæacea*, C. & E., but readily distinguished even by the naked eye, by its *scattered* tufts of hyphæ.

22. CERCOSPORA NYMPHÆACEA, C. & E. Grev. VI. p. 89. N. A. F., No. 50.

Epiphyllous, on pale, suborbicular spots (¼—½ cm.) with a narrow, slightly raised, reddish brown border. Hyphæ slender and nearly hyaline, collected in minute tufts so thickly scattered over the surface of the spots as to appear evenly effused. Conidia very slender, almost thread-like, multiseptate, hyaline (yellowish in the dry specimens) straight or curved 60—90 μ long. The fungus to the naked eye is lead colored. In the dry specimens the spots are concave above and convex below.

On leaves of *Nymphæa odorata*, Newfield, N. J.

23. CERCOSPORA RUBELLA, Cke. Grev. VII. p. 34. Rav. F. Amer. 289.

Hyphæ epiphyllous (amphigenous ?) subfasciculate, brown, on rusty red spots and areas of the leaves, bounded by a narrow, raised border. Conidia cylindrical, attenuated above, hyaline, 1—2 septate, 30—50 μ long.

On leaves of *Eriogonum tomentosum*, S. Carolina (Ravenel.)

24. CERCOSPORA CEPHALANTHI, E. & K. Bull. Torr. Bot. Club, XI. p. 121.

On orbicular (1—4 mm.) red-brown spots with narrow, dark, raised border. Hyphæ mostly epiphyllous, tufted, brown, continuous or faintly septate, 24—30 x 3—4 μ, at length elongated (40—56 μ) and crooked or

undulate above. Conidia (mature?) subfuscous, oblong-cylindric, 20—30 x 3—4 μ, 1—3 septate.

The tufts of hyphæ are very minute and meager, and are seen with difficulty. The conida are not abundant.

On leaves of *Cephalanthus occidentalis*, Kansas (Kellerman).

25. CERCOSPORA GYMNOCLADI, E. & K. l. c.

Mostly epiphyllous on suborbicular, grayish brown spots (3—4 mm.) with a discolored border. Hyphæ in minute punctiform tufts, simple, continuous, brown, 18—25 x 4 μ. Conidia obclavate-cylindric, brown, 3—6 septate, 45—60 x 5—6 μ, but often much shorter (25—35 μ), 2-3-septate and occasionally constricted at the septa.

On leaves of *Gymnocladus Canadensis*, Kansas (Kellerman).

26. CERCOSPORA OMPHAKODES, Ell. & Hol. Jour. of Mycol. I. p. 5.

Amphigenous but more abundant below, on round (5—6 μ) brown spots which are mostly included in pale-brown dead areas of the leaf. Hyphæ brown, continuous or faintly septate, abruptly bent, subgeniculate and imperfectly dentate above, 60—75 x 3 μ; conidia brownish, cylindrical, mostly about 50—60 x 3—3½ μ, faintly 5—6 septate.

On leaves of *Phlox divaricata*, var. *Laphami*. Aug. Iowa (Holway).

The specific name alludes to the tardy maturing of the conida which remain for some time granular and faintly 1—2-septate.

27. CERCOSPORA CIRCUMSCISSA, Sacc., Fungi Ven., nov, V. p. 189. *C. graphioides*, Ell. N. A. F. 646.

Spots round, rusty brown (3—4 mm.) becoming pallid, with a definite concolorous margin surrounded mostly with a red shaded border. Hyphæ amphigenous but mostly hypophyllous, in slender, erect, black, bristle-like fascicles scattered over the surface of the spots, subnodulose and subflexous above (50—75 x 3 μ) dark brown, continuous or faintly septate and united below in a black tubercular base. Conidia obclavate, 50—75 x 3½—4 μ, mostly about 3-septate, black-brown.

On leaves of *Prunus serotina*, Newfield, N. J. Autumn.

It is not absolutely certain that *C. circumscissa*, Sacc., and *C. graphioides*, Ell., are the same, but the probability of their identity is so strong that, for the present at least, we leave the latter as a synonym.

28. CERCOSPORA CONCENTRICA, C. & E., Grev. V. p. 90. *C. Yuccæ*, Ck. Grev. VII. p. 35. Rav. F. Am., no. 290.

Spots large, round or elliptical, ferrugineous, brown becoming gray. Tufts erumpent in subcircinating, tubercular pustules which have been found to be the perithecia of a Sphæria having biseriate, fusoid, hyaline, 1—2 septate, sporidia 12—15 x 2—2½ μ, allied to *Diaporthe gloriosa*, S. & S. The hyphæ of the Cercospora spring directly from these perithecia and are short (12—20 x 4 μ), brown, simple, and continuous, bearing conidia at first hyaline and cylindrical but at length quite distinctly reddish brown, attenuated above 1—5 septate, and 40—70 x 3—4 μ.

On living leaves of *Yucca filamentosa*, Newfield, N. J. *C. Yuccæ*, on *Y. gloriosa*, Ga. (Ravenel.)

Having carefully examined and compared the original specimens, we consider the two species above cited as specifically the same. The specimens of *C. Yuccæ* have thes pots rusty brown, which is also true of *C. concentrica* in the young state. We find the hyphæ in both short.

29. CERCOSPORA HETEROMELES, Hark. Bull. Cal. Acad. Sci., Feb. 1884, p. 38.

Hypophyllous, on reddish brown, suborbicular, definitely limited spots ($\frac{1}{4}$—$\frac{3}{4}$ cm.) with a narrow, raised border; hyphæ very short, brown, arising from a broad (60 80 μ), black, tubercular base; conidia subcylindrical, attenuate above, brown, 5—13 septate, 100—130 x 6 μ. Sometimes the spots are confluent over large areas of the leaf; they are also mostly of a lighter color above (grayish), and often with a dull white spot included in the brown.

On leaves of *Heteromeles arbutifolia*, Berkley, Cal. Sept. (Harkness.)

30. CERCOSPORA POLYGONACEA, E. & E. N. A. F. 1254.

On dark brown spots (2—3 mm.) with a slightly raised, narrow border, around which the leaf is often of a rusty brown, or the whole of the leaf or that part of it including the spots becoming rusty brown and dead. Hyphæ mostly epiphyllous, 80—112 x 4 μ, brown, faintly septate, subgeniculate and imperfectly incise-toothed above. Conidia linear-obclavate, hyaline, rather faintly multiseptate, mostly 80—100 μ long, but exceptionally reaching twice that length.

On leaves of *Polygonum Convolvulus*, Newfield, N. J. Aug. Quite distinct from *C. Polygonorum*, Cke.

31. CERCOSPORA PENTSTEMONIS, E. & K. Bull. Tor. Bot. club, XI, p. 121.

Amphigenous, on orbicular (.25—.5 cm.), purplish brown spots (whitening out), with a narrow, raised border surrounded by a purplish discoloration; hyphæ brown, continuous, nearly straight, subattenuated and more or less denticulate above, 25—35 x 3 μ, forming dark tufts 70 x 80 μ across, and thickly scattered over the spots, Conidia brownish, swollen or enlarged above, 2—2.5 μ thick, and, with the slender filiform base, 40—75 μ long, nucleate, becoming faintly 1—3 septate. The slender base of the conidia is abnormal and may result from imperfect development. The same was observed in *C. oculata*, and *C. tuberosa*.

On *Pentstemon cobæa* the hyphæ are more robust and as well as the conidia darker than on *P. grandiflora*.

32. CERCOSPORA ILICIS, Ell. Bull. Tor. Bot. Club, VIII, p. 65.

Seated on small (2—3 mm.) brown spots which are limited by a narrow, raised border. Hyphæ amphigenous, tufted, septate, subnodulose, 50 x 70 μ long. Conidia terminal, obclavate-cylindrical, hyaline, nucleate and at length 1—3 septate, 35—50 μ long.

On living leaves of *Ilex glabra*, Newfield, N. J., July.

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HETEROECISMAL UREDINEÆ.

BY WM. TRELEASE.

Of late years, most mycologists who have paid any attention to the rust-fungi have had more or less to say about the connection of æcidial forms on the one hand, with teleutosporic forms on the other; and cultures have been tried by experimenters of all grades of skill, with a view to connecting isolated forms of both sorts. As a result, the botanical literature of the last decade or two is filled with notices on the subject, ranging from speculations based on the simultaneous occurrence of two forms, to evidence accumulated in an experimental way by such men as De Bary, Cornu and Magnus.

Since Deslangchamps suggested, in 1862, that Gymnosporangium fuscum might be genetically connected with Roestelia cancellata, Oersted, Cornu, and Magnus have instituted cultures the published results of which show that species of these genera are in reality alternating generations complementary one to the other; yet it should be noted that in this country, where they reach their largest numbers, cultures by Farlow have given only negative or contradictory results, while Rathay has had no better success in Europe.

The experiments of Scholer on Aecidium berberidis, in the early part of the century, and the later and better ones by De Bary, Cornu, Schroeter, and many others, have apparently proved that a number of species of Puccinia and Uromyces are connected with æcidia (often scarcely distinguishable themselves) living on other host-plants, whose only connection with those bearing the teleutospores is cohabitation. Still the number of unconnected æcidial and teleutosporic forms is now large—a fact especially true of America, where cultures have not been resorted to; and even in Europe it is doubtful whether anything is gained by attempts to classify the species with reference to their life-history.

One of the latest papers on heteroecism is by Rostrup (*Revue mycologique*, October, 1884), and contains a number of statements which will interest American students. Puccinia suaveolens, the fragrant rust of the Canada thistle, is joined to the heteroecismal species, although its alternating generations occur on different plants of the same host. Puccinia phragmitis, a rust common on the reed, and morphologically easy of recognition, seems far from being one of the simplest, since Nielsen and Rostrup claim, as the result of cultures, that its æcidium

occurs on Rumex and Rheum, while Cornu produced an æcidium on Ranunculus repens as the result of infection with its teleutospores; so that a strict application of the logic of heteroecism must necessitate the recognition of two species in place of one. Another curious thing about the reed-rusts is, that Puccinia magnusiana, a species morphologically different from the last, also produces cluster-cups on Rumex and Rheum, which cannot be readily separated from those of P. phragmitis, when taken by themselves.

Caeoma, a genus usually placed with the isolated uredo and æcidial forms, is said by Rostrup to be, at least in part, the æcidial stage of Melampsora, which has heretofore been supposed to have no æcidium, if we except the sub-genus Calyptospora. C. euonymi, C. ribesii, and C. mercurialis are respectively connected with M. caprearum, M. hartigii (in part), and M. tremulæ, as the result of experiments; while a species similar to, if not identical with, the last named, is said to cause the development of Cæoma pinitorquum when sown on pines—a fact which, if true, renders intelligible the greater abundance of the Cæoma in the vicinity of aspens, as observed in Jutland.

As now understood, the truly heteroecismal species are brought together in the following list:

TELEUTOSPORIC FORMS.	ÆCIDIA.
Chrysomyxa ledi, (A. & S.)	Æcidium abietinum, A. & S.
" rhododendri	" "
Coleosporium senecionis (P.)	Peridermium pini (Willd.)
Gymnosporangium clavariæforme (Jacq.)	Rœstelia lacerata (Sow.)
	" penicillata (Sow.)
Gymnosporangium juniperinum (L.)	" cornuta, Gmel.
" sabinæ (Dicke.)	" cancellata, Rebent.
Melampsora caprearum, DC	Cæoma euonymi.
" gœppertiana (Kuehn.)	Æcidium columnare, A. & S.
" hartigii, Thuem	Cæoma ribesii, Lk.
" tremulæ, Tul	" pinitorquum, A. Br.?
	" mercurialis.
Puccinia arundinacea, DC	Æcidium ranunculacearum, auct.
" caricis, (Schum.)	" urticæ, Schum.
" coronata, Cda	" rhamni, Gmel.
" dioicæ, Magn	" jacobææ, Grev.
" eriophori, Thuem	" cinerariæ, Rostr.
" graminis, P	" berberidis, Gmel.
" limosæ, Magn	Cæoma lysimachiæ, Schl.
" magnusiana, Koern	Æcidium rubellum, Gmel.
" moliniæ, Tul	" orchidearum, Desm.
" phragmitis, Schum	" rubellum, Gmel.
" poarum, Niels	" tussilaginis, Gmel.
" rubigo vera (DC.)	" asperifolii, P.
" sesleriæ, Reich	" rhamni, Gmel.
" sessilis, Schn	" alli ursini, P.
" silvatica, Schr	" taraxaci, Schm. & Kze.
Uromyces dactylidis, Otth	" ranunculacearum, auct.
" junci (Desm.)	" zonale, Duby.
" pisi (Pers.)	" euphorbiæ, Gmel.
" poæ, Rabh	" ficariæ, P.

NEW LITERATURE.

BY W. A. KELLERMAN.

ELLIS, J. B .& KELLERMAN, W. A.—"Kansas Fungi;" in Bulletin of the Torrey Botanical Club, XI. p.121, continued from page 116.

The descriptions of the following new species are given: Cercospora Apocyni, E. & K., on leaves of Apocynum; Cercospora Desmodii, E. & K., on D. acuminatum; Cercospora Cephalanthi, E. & K., on C. occidentalis; Cercospora Gymnocladi, E. & K., on leaves of G. Canadensis; Cercospora Pentstemonis, E. & K., on P. cobæa and P. grandiflora; Cercospora murina, E. & K., on Viola cucullata; Cercospora velutina, E. & K., on leaves of Baptisia; Ramularia Grindeliæ, E. & K., on leaves of G. squarrosa; Sphærella decidua, E. & K., on leaves of Vernonia Baldwinii and Scrophularia nodosa; Sphærella cercidicola, E. & K., on fallen leaves of Cercis Canadensis; and Sphærella Lactucæ, E. & K., on living leaves of Lactuca Canadensis.

ARTHUR, J. C. "Hollyhock disease and the cotton plant;" in Science, Jan. 2, 1885.

The occurrence of Puccinia Malvacearum, Mont. in Europe is mentioned, noted as a bane to gardens, occurring on many malvaceous plants, twenty-four species as given by Dr. Winter. As to its history Mr. Arthur says: "The disease was introduced into Europe from Chili in 1869, appearing first in Spain. In four years it had spread through France and the southern portions of Germany and England, reaching northern Germany in 1874, and Ireland in 1875. It has also appeared in Australia and the Cape of Good Hope, but it has not yet, in all probability, invaded North America. The plant reported under this name from California is doubtless another species as I am informed by Dr. Farlow who has examined the Californian specimens, although not those of the original collector. The mention by Burrill of its introduction into this country is an error, as I have learned from the author. A disease sometimes spoken of in American journals under this name is due to an entirely different cause." Mr. Plowright investigated, at the suggestion of Mr. Arthur, the liability of the cotton plant becoming infected with this rust. The experiments carried on in England gave negative results, the cotton plant in no case becoming infected.

ELLIS, J. B., & MARTIN, GEO.—"New Species of North American Fungi;" in American Naturalist, Nov. and Dec., 1884.

The following species, collected at Cool Springs, Fla., by Dr. Geo. Martin, are described: Exobasidium Symploci, E. & M., on distorted flower buds of Symplocus tinctoria; Dermatea Sabalidis, E. & M., on dead petioles of Sabal serrulata; Asterina subcyanea, E. & M., on living leaves of Quercus laurifolia; Asterina discordea, E. & M., on living leaves of Quercus laurifolia; Asterina lepidigena, E. & M., attached to the epidermal scales on living leaves of Andromeda ferruginea; Asterina

pustulata, E. & M., on leaves of Quercus laurifolia; Ascomycetella floridana, E. & M., on leaves of Quercus laurifolia; Phyllosticta leucothoes, E. & M., on leaves of Leucothoe acuminata; Phyllosticta sinuosa, E. & M., on leaves of Olea Americana; Phyllosticta corylina, E. & M., on leaves of Corylus Americana; Phyllosticta Apocyni, E. & M., on leaves of Apocynum cannabinum; and Sacidium Polygonati, E. & M.; on dead stems of Polygonatum giganteum.

CRAGIN, F. W.—"First contribution to the Catalogue of the Hymenomycetes and Gasteromycetes of Kansas;" in Bulletin of the Washburn Laboratory of Natural History, Vol. 1, No. 1.

In this paper are given the names and localities of 136 determined species, belonging to genera as follows: Agaricus 22, Coprinus 2, Hygrophorus 2, Lactarius 1, Russula 1, Marasmius 3, Lentinus 1. Panus 2, Schizophyllum 1, Lenzites 1. Boletus 1. Polyporus 39, Trametes 5, Dædalia 6, Favolus 1, Merulius 4, Hydnum 5, Mucronella 1, Irpex 6, Radulum 1, Thelephora 1, Stereum 15, Corticium 9, Solenia 1, Cyphella 1, Calocera 1, Tremella 2, Exidia 1, and Hirneola 1 species.

Those proposed as new are as follows:

AGARICUS ALVEOLATUS, Cragin.—Pileus convex, about an inch across, salmon-red; stipe and gills concolorous; surface of pileus raised into a net-work of ridges or walls, so as to give it a *pitted* appearance; stipe short and thick, the total height of the specimen being about equal to the breadth of the pileus; spores rose white, better described, perhaps, as a delicale salmon-pink. Belongs to the series *Hyporhodii*.

TRAMETES KANSENSIS, Cragin.—Pileus dimidiate, sessile, pitted so as to appear granulate, tumulous, normally once or twice sulcate near the acute margin; from nearly brown on the margin, becoming grayish and then blackish toward the centre; interiorly light chestnut-brown. Hymenial surface fulvous (pallid-fulvous or rufo-fulvous), more or less convex, with a smooth (almost unctuous) feel, easily receiving and retaining the impression of the finger-nail. Pores long, unequal, entire, multiform, largely subrotund, many arcuate, a few even sinuate, obtuse, for the most part rather distant, lined with whitish or grayish-brown. Trama of the pores becoming ferrugineous yellow in a superficial zone, about one-fifteenth to one-twentieth of an inch in thickness in which zone the lining of the pores becomes lighter.

Dædalia ambigua, Berk., var. CORONATA, Cragin.—A specimen of *Dædalia*, taken near Topeka in autumn, agrees well with *ambigua* in texture, color and pores, but differs so remarkably in *form* from any known phase of that species that it seems worthy of distinction, at least as a variety. It has the pileus dimidiate, higher than long, its margin pinched off from the remainder by a deep groove, and separated into four large, broadly rounded, sub-erect, symmetrical lobes, which are well parted at the base, but contiguous above, giving them a pileoloid appearance. The central surface of the pileus is much elevated and evenly rounded.

DÆDALIA TORTUOSA, Cragin.—Pilei dimidiate, convex, often imbri-

cated and confluent, between corky and woody, strigose-roughened, pale yellowish brown, becoming smoother and paler, internally concolorous, zonate, one-twelfth to one-eighth of an inch thick, usually once or twice sulcate near the acute, minutely repand, ferrugineous brown margin, (which is sometimes concolorous.) Hymenium pale cinnamon-brown, generally effused at the base and abruptly sub-porous at the margin. Sinuses labyrinthiform, flexuose, intricate, torn and toothed; very similar to those of *D. unicolor*, *Fr.*, except in color and much larger size.

ELLIS, J. B. & EVERHART, B. M.—"New Species of Fungi from Washington Territory"; in the Bulletin of the Washburn Laboratory of Natural History, Vol. I., No. 1.

These were collected by W. N. Suksdorf during the summer and fall of 1883. The species are as follows: Puccinia asperior, E. & E. æcidium and teleutospores, on Ferula dissoluta; Puccinia Angelicæ, E. & E., uredo and teleutospores; Æcidium Collinsiæ, E. & E., on leaves, flower-bracts, and calyx of Collinsia parviflora; Patellaria signata, E. & E., on dead bark and wood of Tsuga Pattoniana; Leptosphæria hysterioides, E. & E., on dead leaves of Xerophyllum tenax; Pleospora amplispora, E. & E., on dead stems of Lupinus; Lasiosphæria stuppea, E. & E., on dead limb of Tsuga Pattoniana; Anthostomella brachystoma, E. & E., on rotten wood of Tsuga Pattoniana; Ceratostoma tinctum, E. & E., on dead wood of Acer macrophyllum; Teichospora muricata, E. & E., on the bark of same tree; Comatricha Suksdorfi, E. & E., on a trunk of Pinus albicaulis; Lamproderma robusta, E. & E., on woody branches of Aplopappus Bloomeri; Phoma Lupini, E. & E., on living leaves of Lupine (?); Hendersonia diplodioides, E. & E., on bark of Sambucus glauca; Hendersonia cylindrocarpa, E. & E,, on dead scape of Brodiæa Howellii; and Excipula conglutinata, E. & E., on dead stems of Valeriana capitata.

HARKNESS, H. W.—"New Species of California Fungi;" in Bulletin of the California Academy of Sciences, No. 1, Feb. 1884.

Dr. Harkness here describes seventy-one species and proposes four new genera each including one species, as follows:

CAMPOSPORIUM, Hk.

(*Etym. Campe*: larva, from the resemblance of the spore to the larva of Danais Archippus.)

Hypha brown, flexuous, septate. Spores 1—2, attached by slender pedicels to the angles of the apex, transversely pluriseptate with filiform setæ springing from the apex.

CAMPOSPORIUM ANTENNATUM, Hk.

Hyphæ septate, flexuous, brown; spores 1—2, cylindrical, pale olive brown, 7—13 septate, attached to the apical angles of the hyphæ by filiform spiral pedicels; ultimate cells hyaline, the upper one bearing two, sometimes one or three, filiform setæ $\frac{1}{8}$—$\frac{1}{2}$ as long as the spore, 70—94 x 10 μ. On decaying bark of Eucalyptus globulus, December.

TROPOSPORIUM, Hk.

Sporodochium flattened, farinaceous. Hyphæ elongated, lax, branching. Spores spiral, attached to the hyphæ by slender, pedicel-like branchlets. Allied to Fusisporium, but with very different spores.

TROPOSPORIUM ALBUM, Hk.

Acervuli white, 1—2 mm., often confluent, thick, branching freely, without septa, containing numerous granules and oil globules which are set free by breaking; spore—a long tube, granular, nucleolate, without septa, 7 μ wide, coiled in a long spiral of 3—7 turns, flattened at the crossings, forming an oblong mass, with crenate borders 40—45 x 12—22 μ.

On dead stems of Corylus rostrata. December.

THECLOSPORA, Hk.

Spores surrounded by a cleft, hyaline border, borne on slender, branching hyphæ, compacted into a globular, woody mass.

THECLOSPORA BIFIDA, Hk.

Heaps scattered, globular, 1—2 mm. in diameter, loosely attached to the surface, white, becoming yellow; hyphæ arising from irregular, yellowish, elongated masses, rough, slender, bearing at intervals granular spores, surrounded by a broad and firm hyaline or yellowish border, marked with concentric striæ, and cleft on opposite sides, the hypha apparently passing through, 24—40 μ.

On rotting leaves of Eucalyptus globulus, December.

The place of this fungus in classification is very uncertain, and it is only placed here because of its connection with the next.

CLEISTOSOMA, Hk.

Perithecia orbicular, membraneous. Asci borne on branching threads, globose, evanescent. Sporidia hemispherical, echinulate.

CLEISTOSOMA PURPUREUM, Hk.

Perithecia purple black, very delicate, soon dehiscent, developed within the heaps of Cleistosoma purpureum, which it stains purple; asci globular, hyaline, 8—spored, 9—12 μ; sporidia purple, hemispherical, long echinulate around the disk margin, 3—4 μ.

BURRILL, T. J. "New Species of Uredineæ;" in Botanical Gazette, Dec. 1884.

The species described are from large collections of Illinois fungi made mostly by Mr. A. B. Seymour for the State Laboratory of Natural History. Mr. Seymour is author of the last three species named in the list; Uromyces Œnotheræ, Burrill, I, II, and III, on Œ. linifolia; Uromyces Scirpi, Burrill, II and III, on S. fluviatilis; Uromyces graminicola, Burrill, on Panicum virgatum and Elymus Virginicus; Puccinia tenuis, Burrill, I (Æcidium tenue, Schw.) and III, on leaves of Eupatorium ageratoides; Puccinia Seymeriæ, Burrill, III. on S. macrophylla; Melampsora Crotonis (Cooke), II and III, (Trichobasis Crotonis, Cooke) on leaves of Croton capitatum, C. mononthogynus, and Crotonopsis line-

aris; Æcidium Dicentræ, Burrill, on D. Cucullaria; Æcidium Onobrychidis, Burrill, on Psoralea Onobrychis; Æcidium Diodiæ, Burrill, on D. teres; Æcidium Myosotidis, Burrill, on M. verna; Æcidium Physalidis Burrill, on P. viscosa; Æcidium Crotonopsidis, Burrill, on C. linearis; Æcidium Trillii, Burrill, on T. recurvatum; Puccinia Ranunculi, Seymour, III, on R repens; Puccinia Conoclinii, Seymour, II and III, on leaves of C. cœlestinum. ("This is P. Centaureæ, DC. of Berkley's Notices of North American Fungi, Grev. III., p. 53, as ascertained by examination of the original specimen in Herb. Curtis, but it differs from authentic specimens bearing this name in various exsiccati," l. c. p. 191), and Æcidium Cephalanthi, Seymour.

ELLIS, J. B., & HARKNESS, H. W.—"New Californian Fungi," in Bulletin of the California Academy of Sciences, No. 1, Feb. 1884.

The following species are described: Puccinia congregata, E. & Hk., hymenium and stylospores unknown, teleutospores on living leaves of Heuchera micrantha; Puccinia digitata, E. & Hk., teleutospores only known, on living leaves of Rhamnus crocea; Puccinia melanconoides, E. & Hk., stylospores unknown, hymenium and teleutospores on the upper surface of living leaves of Dodecatheon Meadia; Puccinia nodosa, E. & Hk., teleutospores only known, on living leaves of Brodiœa capitata: Uromyces Brodieæ, E. & Hk., hymenium (Æcidium Brodieæ, E. & Hk.) stylospores uncertain, teleutospores on living leaves of Brodiæa laxa: Uromyces Chorizanthis, E. & Hk., hymenium unknown, stylospores and teleutospores, on stems of Chorizanthe pungens; Uromyces Eriogoni, E. & Hk., hymenium, stylospores and teleutospores, on stems of Eriogonum virgatum; and Hymenula aciculosa, E. & Hk., on leaves of Pinus ponderosa.

PHILLIPS, WILLIAM, & HARKNESS, H. W.—"Fungi of California;" in Bulletin of the California Academy of Sciences, No. 1, Feb., 1884.

Contains descriptions of eight new species of Peziza, two of Calloria, one of Belonidium, two of Phillipsiella, and one each of Helotium, Boudiera, Patellaria, Midotis, Stictis, Triblidium, Hysterium and Ailographum.

PLOWRIGHT, C. B., & HARKNESS, H. W.—"New Species of California Fungi;" in Bulletin of the Academy of Sciences, No. 1, Feb. 1884.

Nectria Galii, Pl. & Hk., and N. umbellulariæ, Pl. & Hk., are described.

GYMNOSPORIUM HARKNESSIOIDES, Ell. & Hol.

(*Journal of Mycology, No. 1, p. 6.*)

Mr. Holway sends the following additional note:

"I found these spores very abundant on leaves of nearly every plant in the grove where I first discovered it. No immature stage could be found. It often occurred on every leaf of a tall *Lophanthus*, where it would seem impossible for a fungus to discharge its spores. They are much like the spores of some Sordaria, but the most careful search failed to find any such origin for it."

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